AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

60. (new): An electrode for discharge surface treatment of a work piece, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, wherein

the powder has an average particle diameter of not less than 10 nanometers and not more than 3 micrometers, and the electrode material of the electrode has substantially uniform composition and capable of forming a thick film with thickness not less than 100 micrometers.

61. (new): The electrode according to claim 60, wherein the powder includes any one selected from a group essentially consisting of stellite, Ti-coated CBN, Tic+Ti, Cr_2C_3+Cr, Cr_2C_3+stellite, Al_2O_3+Ni, ZrO_2+Ni, and stellite+Co.

62. (new): The electrode according to claim 60, wherein particles of the powder have an aspherical shape.

63. (new): The electrode according to claim 62, wherein particles of the powder are any one of scaly and polygonal in shape.

64. (new): The electrode according to claim 60, wherein the powder has an average particle diameter of not less than 10 nanometers and not more than 1 micrometer.

65. (new): The electrode according to claim 64, wherein the powder contains any one of Co powder, Co alloy powder, Mo powder, Cr powder, W powder, Zr powder, Ta powder, Ti powder, V powder, and Nb powder.

66. (new): An electrode for discharge surface treatment of a work piece, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, wherein

the powder includes a portion that has an average particle diameter of not less than 10 nanometers and not more than 3 micrometers, the portion being not less than 10% of total volume of the powder, and the electrode material of the electrode has both uniform composition and unit for hardness and is capable of forming a thick film with thickness not less than 100 micrometers.

67. (new): The electrode according to claim 66, wherein particles of a specific component of the powder have different particle diameters.

68. (new): The electrode according to claim 66, wherein the powder includes any one selected from a group essentially consisting of stellite, Ti-coated CBN, Tic+Ti, Cr_2C_3+Cr, Cr_2C_3+stellite, Al_2O_3+Ni, ZrO_2+Ni, and stellite+Co.

69. (new): The electrode according to claim 66, wherein the electrode material of the electrode is capable of forming a thick film with thickness not less than 100 micrometers, and the powder contains 80% or more of powder with an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer as the electrode material.

70. (new): The electrode according to claim 69, wherein the powder contains any one of Co powder, Co alloy powder, Mo powder, Cr powder, W powder, Zr powder, Ta powder, Ti powder, V powder, and Nb powder.

71. (new): An electrode for discharge surface treatment of a work piece, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a work piece

using energy produced by the electric discharge, wherein

the electrode material of the electrode has uniform hardness and is capable of forming a thick film with thickness not less than 100 micrometers, the powder is obtained by mixing a small-diameter powder having a distribution of small particle diameters and a large-diameter powder having an average particle diameter twice or more as large as the small-diameter powder, and the large-diameter powder is a mixture in 5 to 60 volume percent.

72. (new): The electrode according to claim 71, wherein the small-diameter powder is metal powder refined by grinding.

73. (new): The electrode according to claim 71, wherein the large-diameter powder has a substantially spherical shape.

74. (new): The electrode according to claim 71, wherein the powders to be mixed have an identical component.

75. (new): The electrode according to claim 71, wherein the powder is any one selected from a group consisting of Co alloy, Ni alloy, and Fe alloy.

76. (new): The electrode according to claim 71, wherein the large-diameter powder is in 5 to 20 volume percent.

77. (new): An electrode for discharge surface treatment of a work piece, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, wherein

the electrode material of the electrode has uniform hardness and is capable of forming a thick film with thickness not less than 100 micrometers, the powder is obtained by mixing a small-diameter powder having a distribution of small particle diameters not more than 3 micrometers and a large-diameter powder having an average particle diameter not less than 5 micrometers, and the large-diameter powder is in 5 to 20 volume percent.

78. The electrode according to claim 77, wherein the small-diameter powder is metal powder refined by grinding.

79. (new): The electrode according to claim 77, wherein the large-diameter powder has a substantially spherical shape.

80. (new): The electrode according to claim 77, wherein the powders to be mixed have an identical component.

81. (new): The electrode according to claim 77, wherein the powder is any one selected from a group consisting of Co alloy, Ni alloy, and Fe alloy.

82. (new): The electrode according to claim 77, wherein the large-diameter powder is in 5 to 20 volume percent.

83. (new): A manufacturing method for an electrode for discharge surface treatment, comprising:

a first step of grinding powder of metal, a metallic compound, or ceramics into aspheric powder having a predetermined particle diameter and scaly shape with a grinder; and

a second step of compress-molding the powder ground into a predetermined shape to have predetermined uniform hardness.

84. (new): The manufacturing method according to claim 83, wherein the grinder is a mill apparatus.

85. (new): The manufacturing method according to claim 84, wherein the mill apparatus is any one of a ball mill apparatus, a bead mill apparatus, a vibrating mill apparatus, and a jet mill apparatus.

86. (new): The manufacturing method according to claim 84, wherein the mill apparatus includes a container and balls made of a same material as material of the powder to be ground.

87. (new): The manufacturing method according to claim 84, wherein the mill apparatus includes a container and balls with surfaces thereof subjected to build up welding, plating, or thermal spraying using a same material as a material of the powder to be ground.

88. (new): The manufacturing method according to claim 84, wherein a material of the mill apparatus is ZrO_2.

89. (new): The manufacturing method according to claim 83, wherein, in the first step, the predetermined particle diameter is not more than 3 micrometers.

90. (new): A method for discharge surface treatment of a work piece with an electrode, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, comprising:

forming the film using a uniform electrode obtained by compression-molding powder with an average value of particle diameters not less than 10 nanometers and not more than 3 micrometers by using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers.

91. (new): The method according to claim 90, wherein the powder has an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer.

92. (new): The method according to claim 91, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

93. (new): The method according to claim 91, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

94. (new): The method according to claim 91, wherein the powder is powder of metal, a metal compound, or ceramics.

95. (new): A method for discharge surface treatment of a work piece with an electrode, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece in an atmosphere of a machining medium and forming a film of a machining material on a surface of a

work piece using energy produced by the electric discharge, comprising:

forming the film using an electrode having uniform composition and hardness and obtained by compression-molding powder mixed with powder having a particle diameter not less than 10 nanometers and not more than 3 micrometers mixed in a proportion not less than 10% in the powder, and using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers.

96. (new): The method according to claim 95, wherein the electrode contains 80% or more of powder having an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer.

97. (new): The method according to claim 96, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

98. (new): The method according to claim 96, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

99. (new): The method according to claim 96, wherein the powder is powder of metal, a metal compound, or ceramics.

100. (new): A method for discharge surface treatment of a work piece with an electrode, the electrode being made of a green compact obtained by compression-molding an electrode material including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, comprising:

forming the film by using a uniform electrode obtained by mixing a small-diameter powder having a distribution of small particle diameters and a large-diameter powder having an average particle diameter twice or more as large as the small-diameter powder and compression-molding the powders, the large-diameter powder being in 5 to 60 volume percent, and by using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers.

101. (new): The method according to claim 100, wherein the small-diameter powder is powder refined by grinding.

102. (new): The method according to claim 100, wherein the large-diameter powder has a substantially spherical shape.

103. (new): The method according to claim 100, wherein the small-diameter particle and the large-diameter particle have an identical component.

104. (new): The method according to claim 100, wherein the powder is any one of Co alloy, Ni alloy, and Fe alloy.

105. (new): The method according to claim 100, wherein the large-diameter powder is in 5 to 20 volume percent.

106. (new): The method according to claim 100, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

107. (new): The method according to claim 100, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

108. (new): A method for discharge surface treatment of a work piece with an electrode, the electrode being made of a green compact obtained by compression-molding an electrode material

including powder of any of a metal and a metallic compound, and the discharge surface treatment generating an electric discharge between the electrode and the work piece and forming a film of a machining material on a surface of a work piece using energy produced by the electric discharge, comprising:

forming the film by using a uniform electrode obtained by mixing a small-diameter powder having a distribution of small particle diameters not more than 3 micrometers and a large-diameter powder having an average particle diameter not less than 5 micrometers and compression-molding the powders, the large-diameter powder being in 5 to 60 volume percent, and by using electrode material that is capable of forming a thick film with thickness not less than 100 micrometers.

109. (new): The method according to claim 108, wherein the small-diameter powder is powder refined by grinding.

110. (new): The method according to claim 108, wherein the large-diameter powder has a substantially spherical shape.

111. (new): The method according to claim 108, wherein the small-diameter particle and the large-diameter particle have an identical component.

112. (new): The method according to claim 108, wherein the powder is any one of Co alloy, Ni

alloy, and Fe alloy.

113. The method according to claim 108, wherein the large-diameter powder is in 5 to 20 volume percent.

114. (new): The method according to claim 108, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

115. (new): The method according to claim 108, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

116. (new): A discharge surface treatment apparatus that has an electrode consisting of a green compact obtained by compression-molding powder of metal or a metallic compound and a work piece on which a film is formed, the electrode and the work piece being arranged in a machining fluid or in an air, generates a pulsed electric discharge between the electrode and the work piece using a power supply apparatus electrically connected to the electrode and the work piece, and forms, using discharge energy of the electric discharge, a film consisting of an electrode material

or a substance generated by reaction of the electrode material due to the discharge energy on a surface of the work piece, wherein

the powder has an average particle diameter of not less than 10 nanometers and not more than 3 micrometers, and the electrode material of the electrode has substantially uniform composition and capable of forming a thick film with thickness not less than 100 micrometers.

117. (new): The discharge surface treatment apparatus according to claim 116, wherein powder with an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer is used.

118. (new): The discharge surface treatment apparatus according to claim 117, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

119. (new): The discharge surface treatment apparatus according to claim 117, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

120. (new): The discharge surface treatment method according to claim 117, wherein the powder

is powder of metal, a metal compound, or ceramics.

121. (new): A discharge surface treatment apparatus that has an electrode consisting of a green compact obtained by compression-molding powder of metal or a metallic compound and a work piece on which a film is formed, the electrode and the work piece being arranged in a machining fluid or in an air, generates a pulsed electric discharge between the electrode and the work piece using a power supply apparatus electrically connected to the electrode and the work piece, and forms, using discharge energy of the electric discharge, a film consisting of an electrode material or a substance generated by reaction of the electrode material due to the discharge energy on a surface of the work piece, wherein

the powder includes a portion that has an average particle diameter of not less than 10 nanometers and not more than 3 micrometers, the portion being not less than 10% of total volume of the powder, and the electrode material of the electrode has both uniform composition and unit for hardness and is capable of forming a thick film with thickness not less than 100 micrometers.

122. (new): The discharge surface treatment apparatus according to claim 121, wherein the electrode contains 80% or more of powder having an average value of particle diameters not less than 10 nanometers and not more than 1 micrometer.

123. (new): The discharge surface treatment apparatus according to claim 122, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

124. (new): The discharge surface treatment apparatus according to claim 122, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

125. (new): The discharge surface treatment method according to claim 122, wherein the powder is powder of metal, a metal compound, or ceramics.

126. (new): A discharge surface treatment apparatus comprising:

an electrode consisting of a green compact obtained by compression-molding powder of metal or a metal compound;

a work piece on which a film is formed; and

a power supply apparatus electrically connected to the electrode and the work piece,

the discharge surface treatment apparatus generating pulse-like electric discharge between the electrode and the work piece with the power supply apparatus and forming, using discharge energy of the discharge, a film consisting of an electrode material or a substance generated by reaction of the electrode material due to the discharge energy on a surface of the

work piece, wherein

a uniform electrode is manufactured from an electrode material that is obtained by mixing a small-diameter powder having a distribution of small particles and a large-diameter powder having an average particle diameter twice or more as large as the small-diameter powder, the large-diameter powder being in 5 to 60 volume percent, and the electrode material being capable of forming a thick film with thickness not less than 100 micrometers.

127. The discharge surface treatment apparatus according to claim 126, wherein the small-diameter powder is powder refined by grinding.

128. (new): The discharge surface treatment apparatus according to claim 126, wherein the large-diameter powder has a substantially spherical shape.

129. (new): The discharge surface treatment apparatus according to claim 126, wherein the small-diameter particle and the large-diameter particle have an identical component.

130. (new): The discharge surface treatment apparatus according to claim 126, wherein the powder is any one of Co alloy, Ni alloy, and Fe alloy.

131. (new): The discharge surface treatment apparatus according to claim 126, wherein the large-diameter powder is in 5 to 60 volume percent.

132. (new): The discharge surface treatment apparatus according to claim 126, wherein the large-diameter powder is in 5 to 20 volume percent.

133. (new): The discharge surface treatment apparatus according to claim 126, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

134. (new): The discharge surface treatment apparatus according to claim 126, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.

135. (new): A discharge surface treatment apparatus comprising:

an electrode consisting of a green compact obtained by compression-molding powder of metal or a metal compound;

a work piece on which a film is formed; and

a power supply apparatus electrically connected to the electrode and the work piece,

the discharge surface treatment apparatus generating pulse-like electric discharge between the electrode and the work piece with the power supply apparatus and forming, using discharge energy of the discharge, a film consisting of an electrode material or a substance

generated by reaction of the electrode material due to the discharge energy on a surface of the work piece, wherein

a uniform electrode is manufactured from an electrode material that is obtained by mixing a small-diameter powder having a distribution of small particles not more than 3 micrometers and a large-diameter powder having an average particle diameter not less than 5 micrometers, the large-diameter powder being in 5 to 60 volume percent, and the electrode material being capable of forming a thick film with thickness not less than 100 micrometers.

136. (new): The discharge surface treatment apparatus according to claim 135, wherein the small-diameter powder is powder refined by grinding.

137. (new): The discharge surface treatment apparatus according to claim 135, wherein the large-diameter powder has a substantially spherical shape.

138. (new): The discharge surface treatment apparatus according to claim 135, wherein the small-diameter particle and the large-diameter particle have an identical component.

139. (new): The discharge surface treatment apparatus according to claim 135, wherein the powder is any one of Co alloy, Ni alloy, and Fe alloy.

140. (new): The discharge surface treatment apparatus according to claim 135, wherein the large-

diameter powder is in 5 to 60 volume percent.

141. (new): The discharge surface treatment apparatus according to claim 135, wherein the large-diameter powder is in 5 to 20 volume percent.

142. (new): The discharge surface treatment apparatus according to claim 135, wherein

the electrode and the work piece are arranged in a machining fluid or a predetermined gas atmosphere, and

electric discharge is performed in the machining fluid or the predetermined gas atmosphere.

143. (new): The discharge surface treatment apparatus according to claim 135, wherein a pulse current with a discharge pulse width not more than 70 microseconds and a peak current value not more than 30 amperes is supplied between the electrode and the work piece.